

Observing System Simulation Experiments to Determine the Impact of Spaceborne Differential Absorption Radar Measurements of Marine Surface Pressure on Numerical Weather Prediction

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- Combined active/passive microwave instrument at V-band (64-70 GHz)
- Retrieve surface pressures
- Airborne flights in 2024

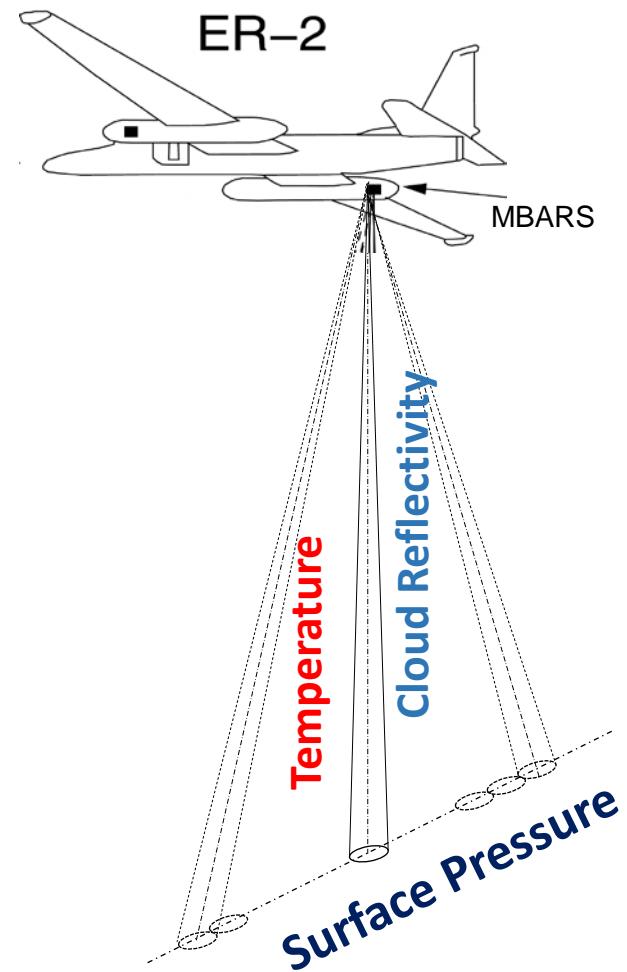


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REMOTE SENSING
SOLUTIONS





- Evaluate the potential impact of spaceborne radar measurements of marine surface pressures on numerical weather prediction (NWP)
- Trade space experiments for instrument requirements

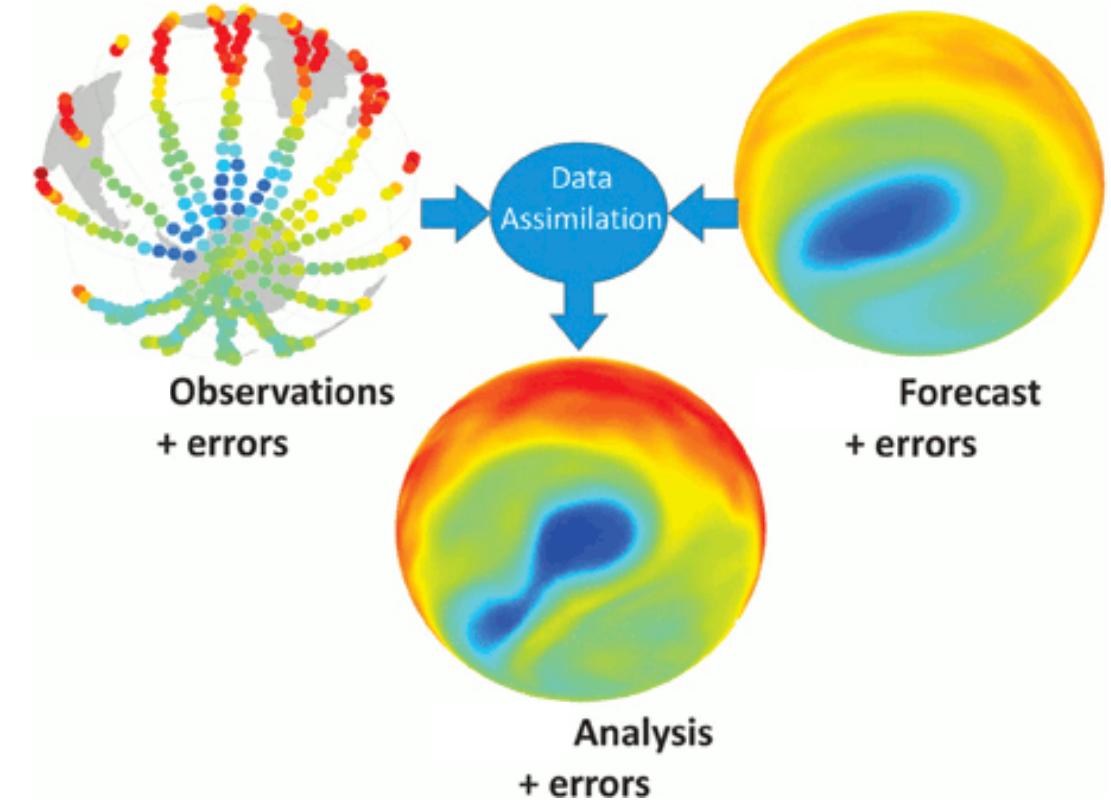
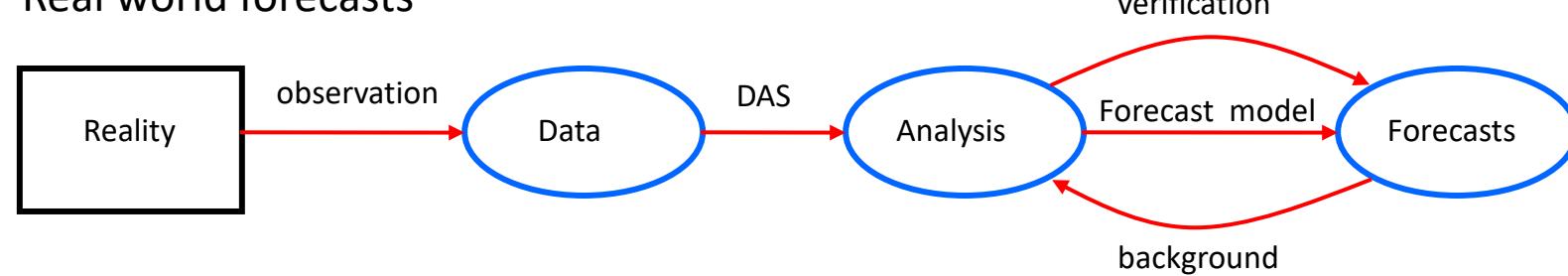


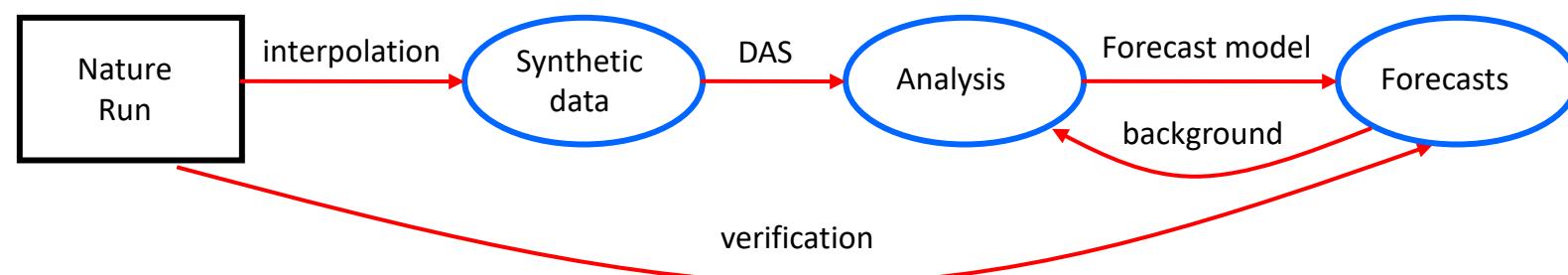
Image: Lahoz, W. and P. Schneider, *Front. Environ. Sci.*, 2014, with permission

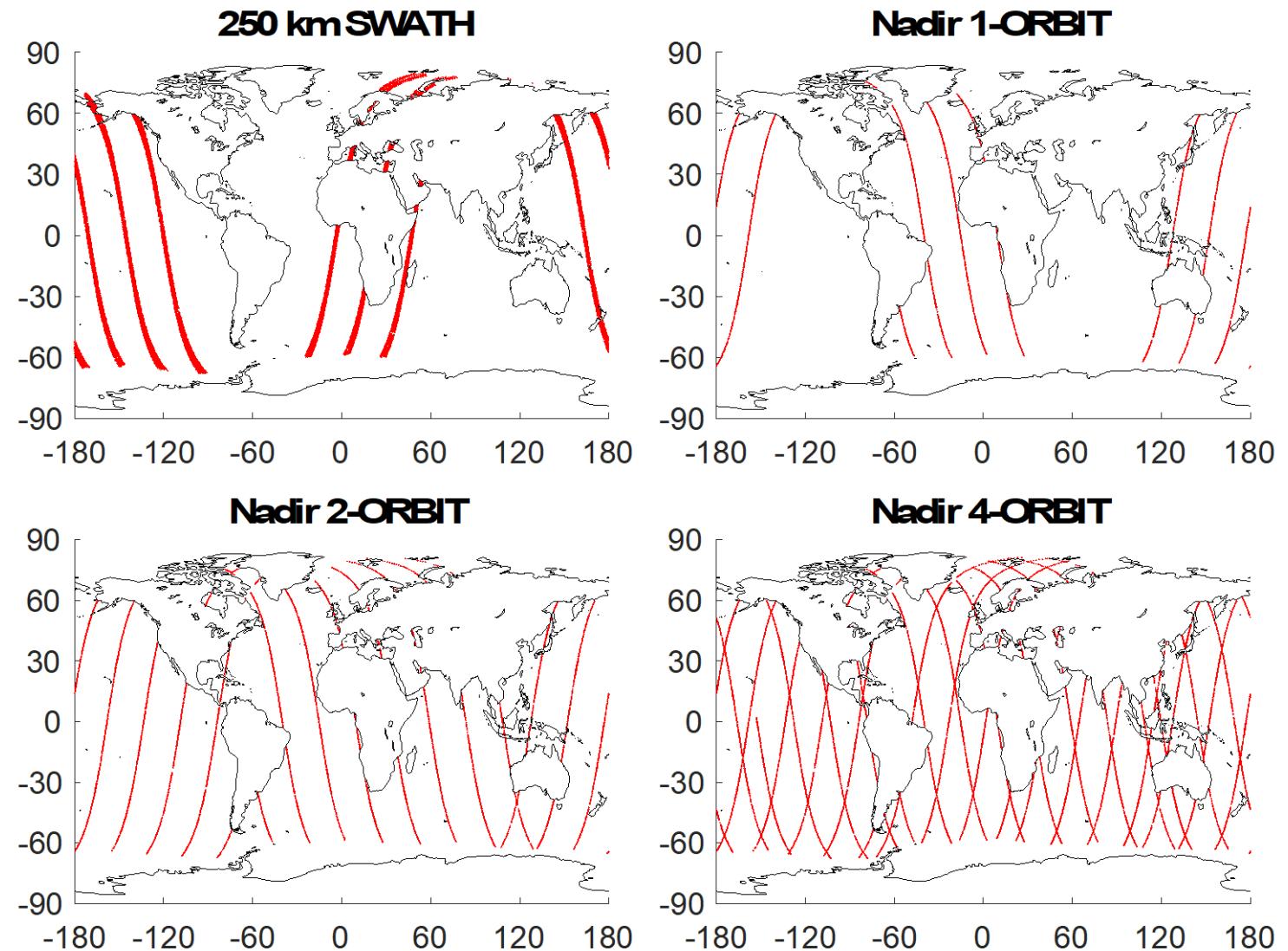


Real world forecasts



OSSE forecasts



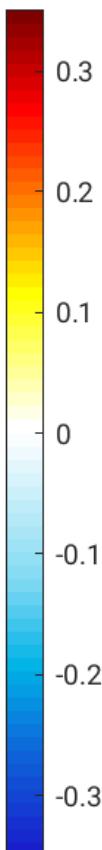
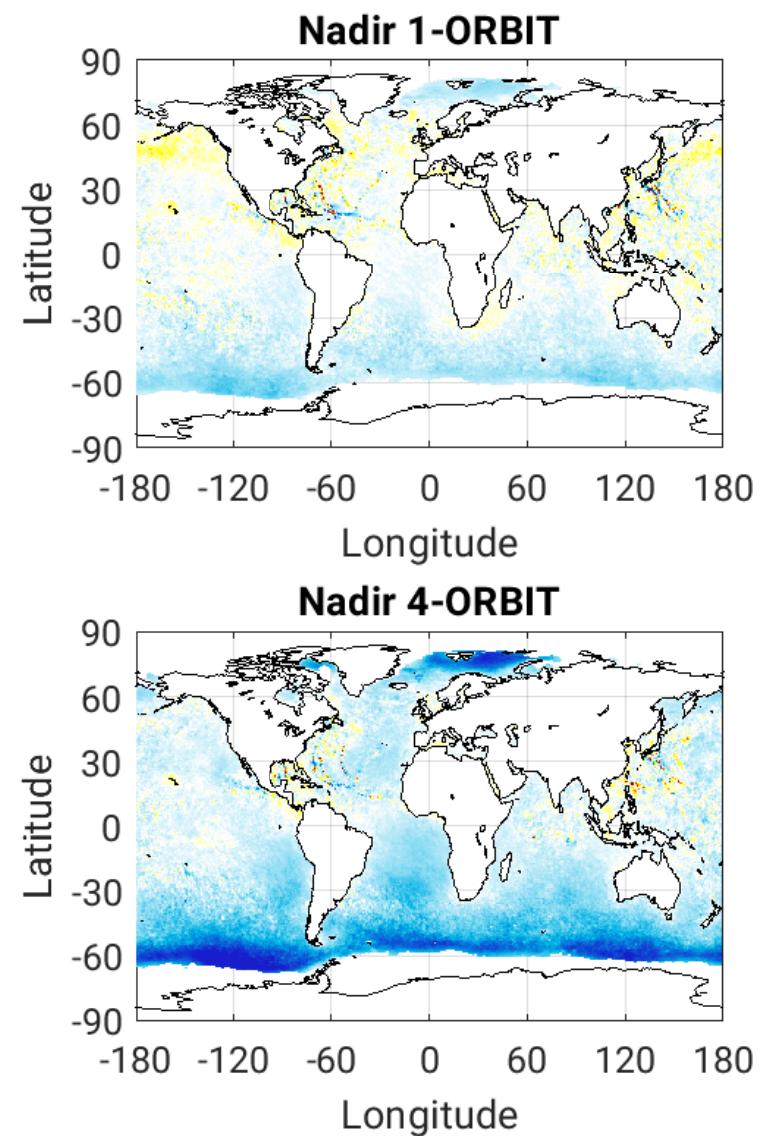
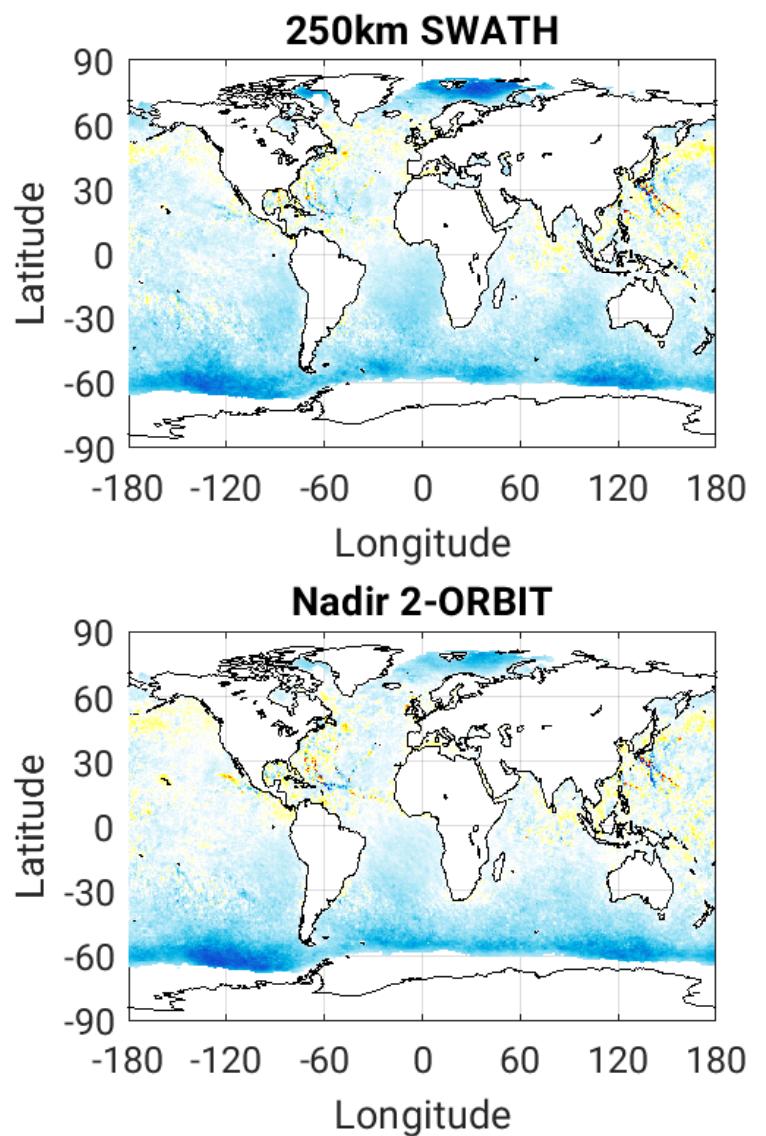


BLUE = Beneficial

YELLOW = Degradation

Control = no radar

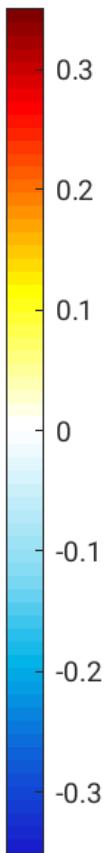
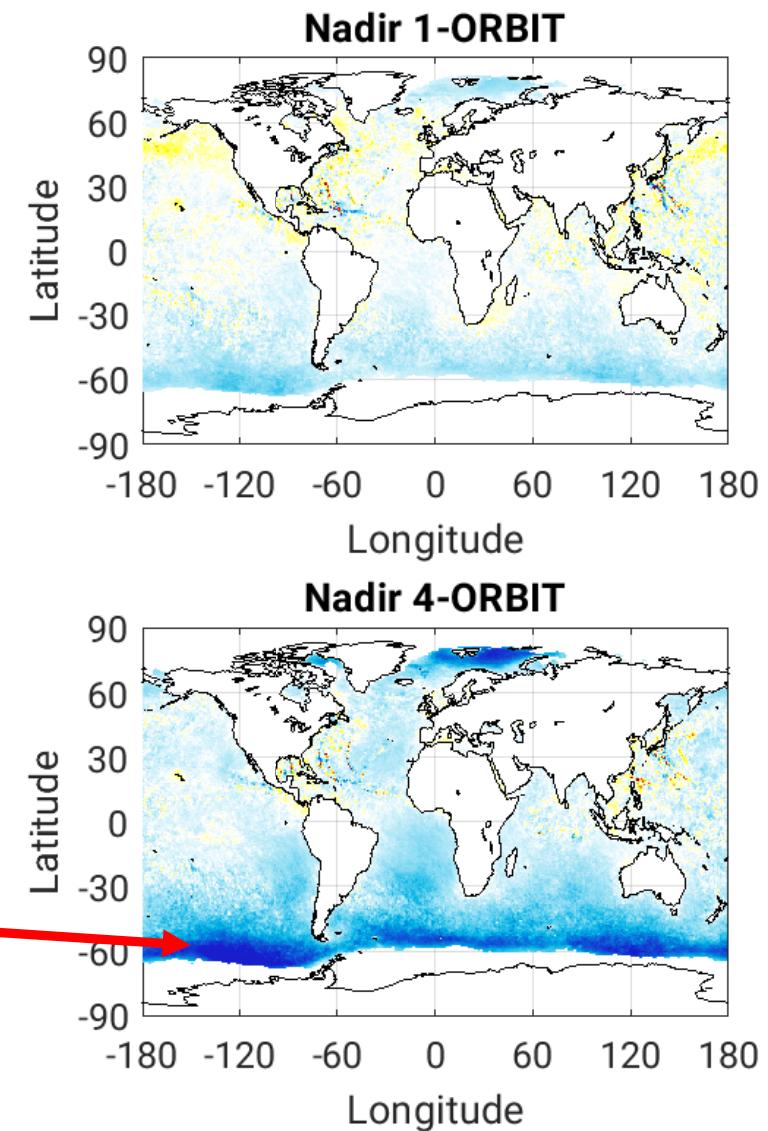
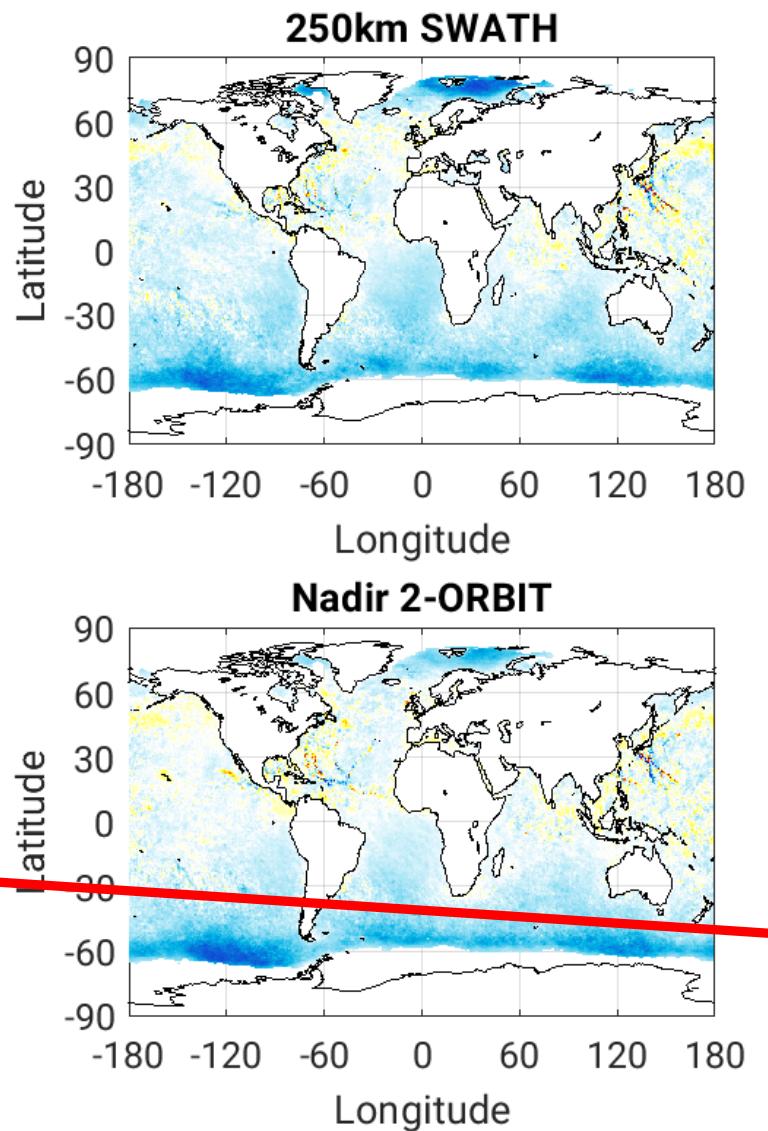
Fractional difference in
surface pressure RMSE



BLUE = Beneficial

YELLOW = Degradation

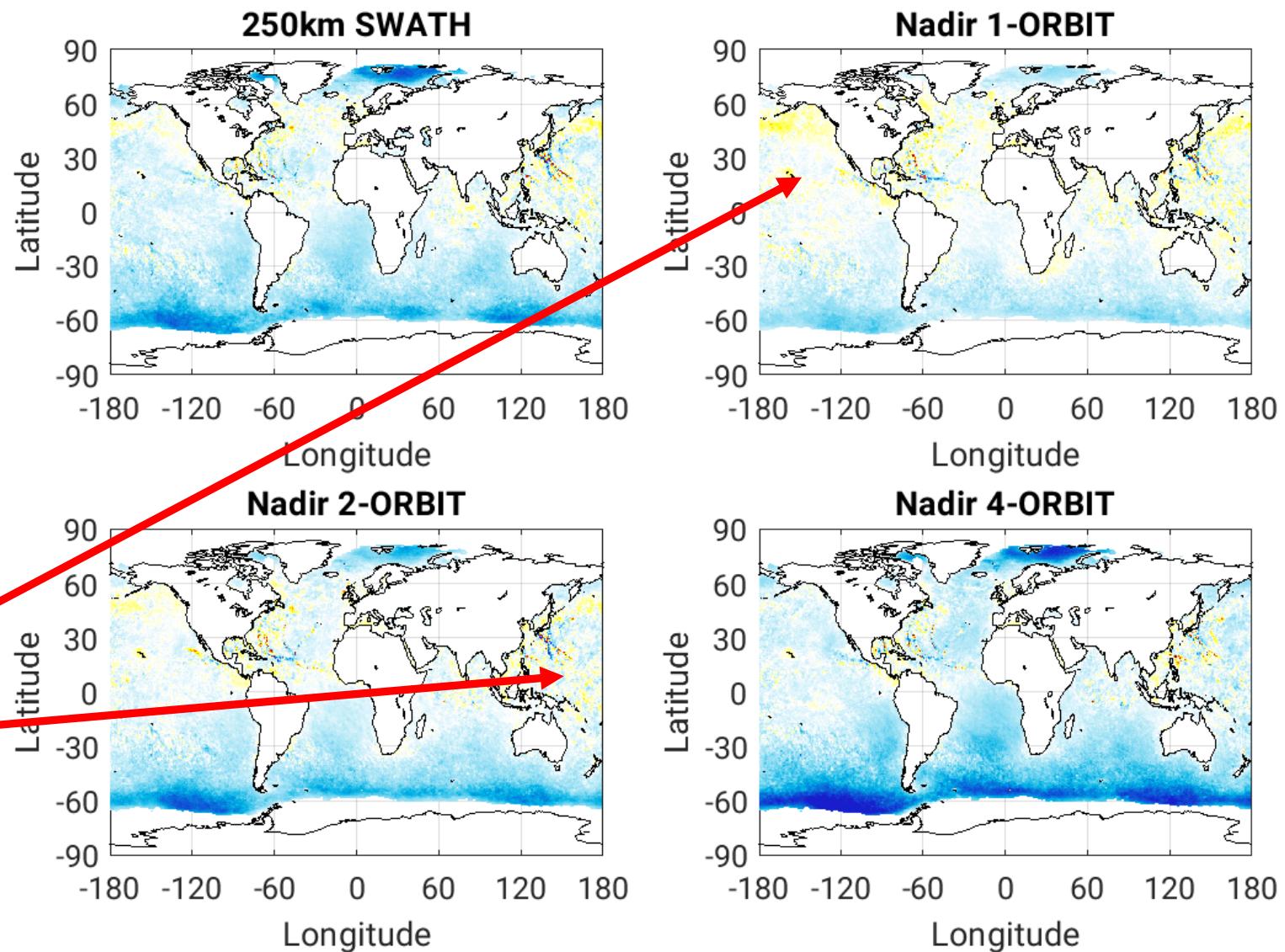
> 30% localized
improvement



BLUE = Beneficial

YELLOW = Degradation

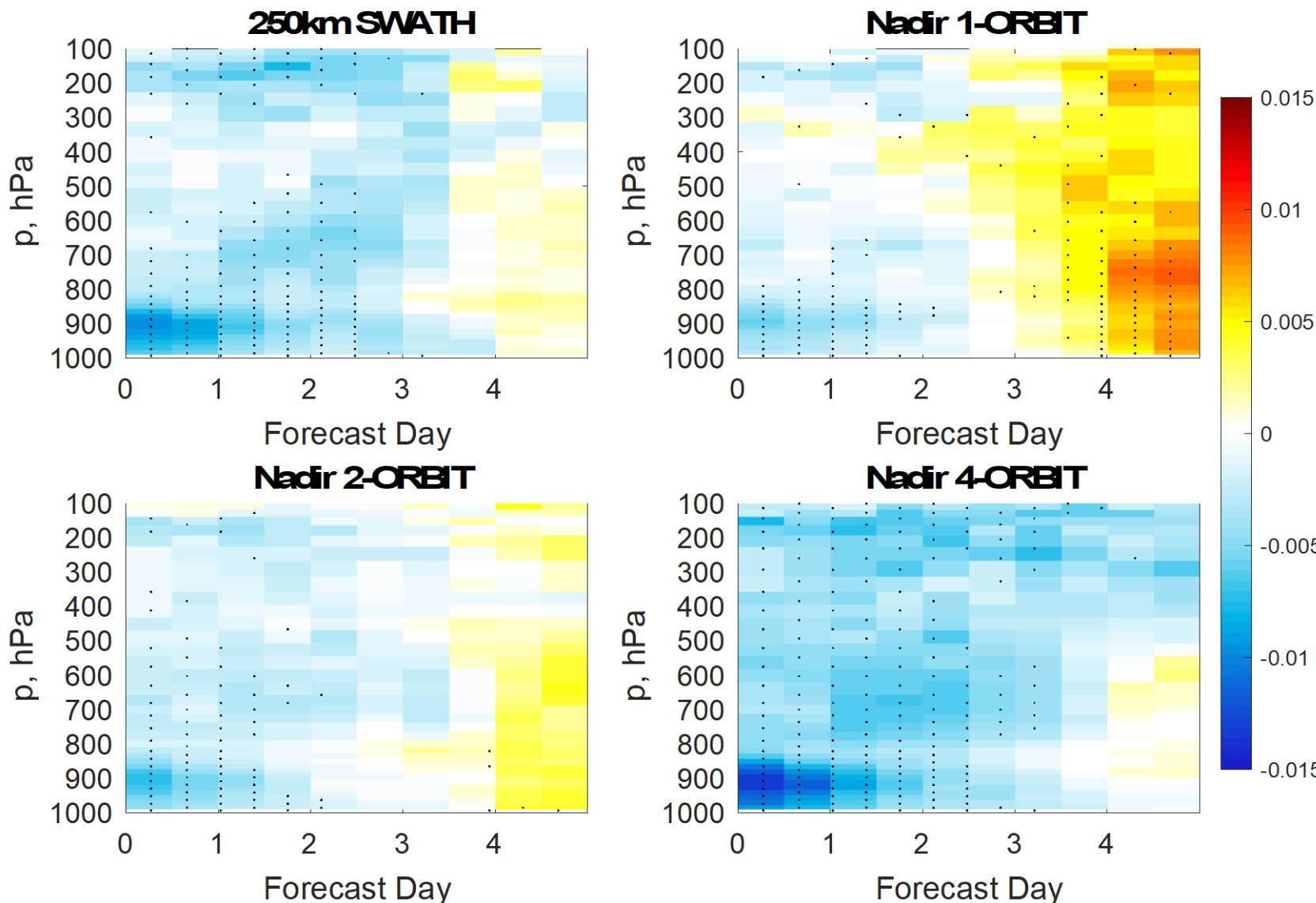
Degradation –
model feedback



BLUE = Beneficial

YELLOW = Degradation

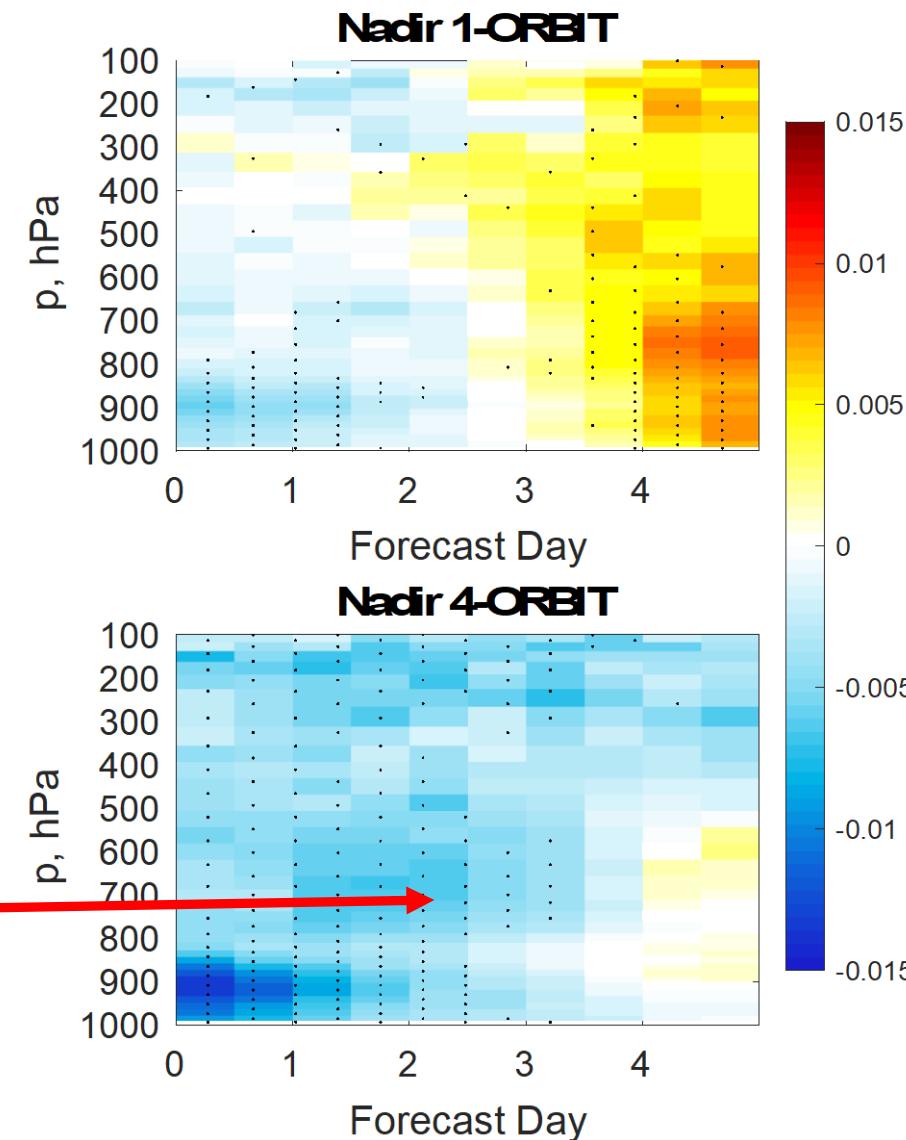
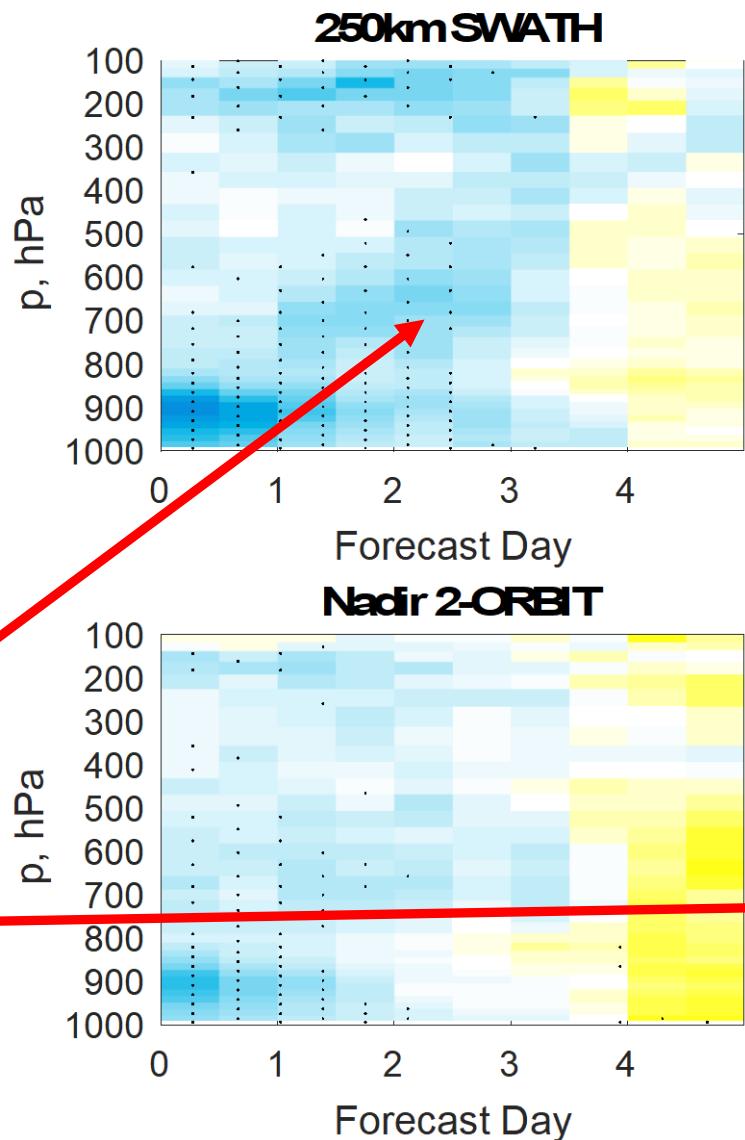
Fractional difference in
T forecast RMSE,
20S-90S



BLUE = Beneficial

YELLOW = Degradation

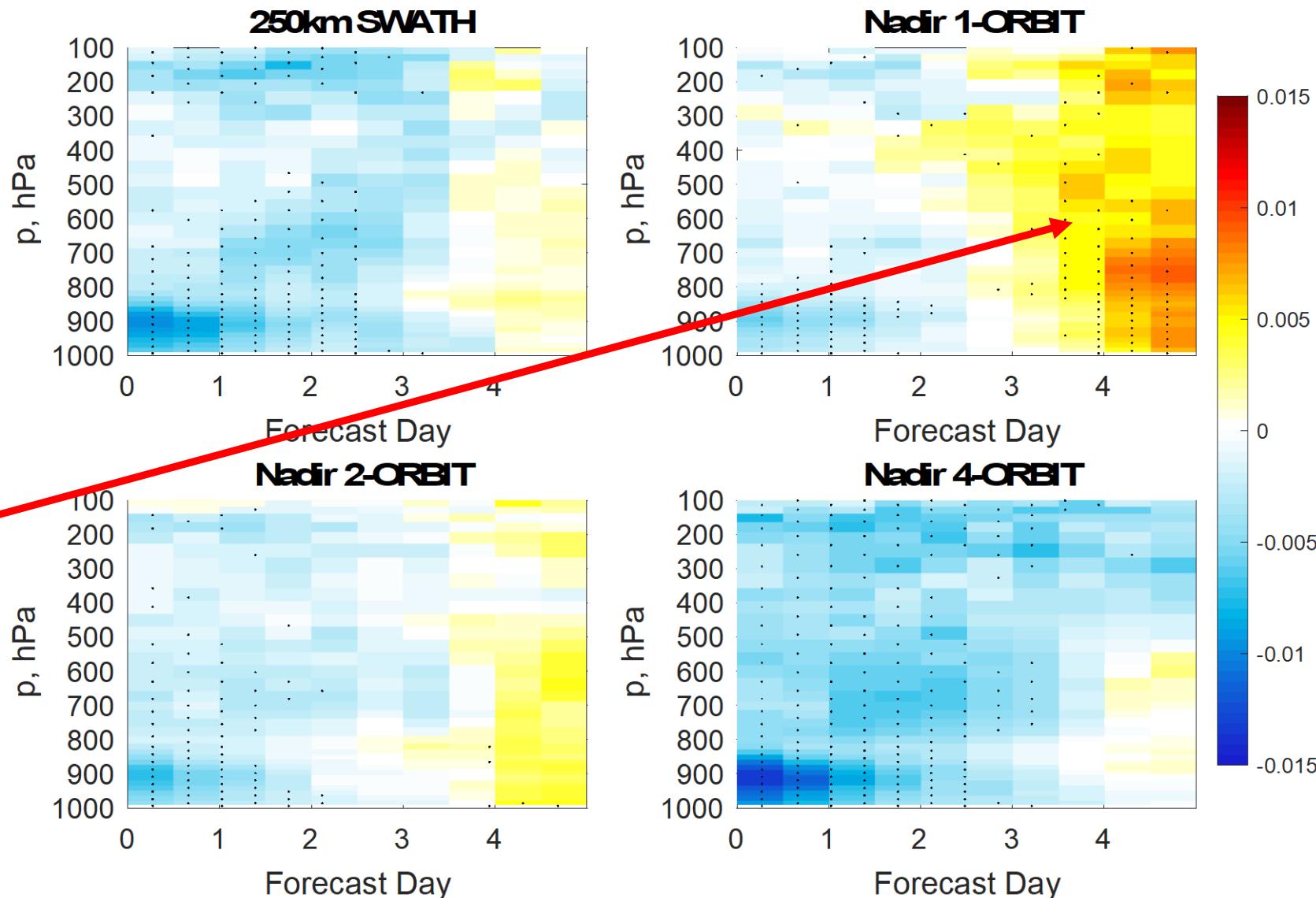
Improvement
48-72 hours



BLUE = Beneficial

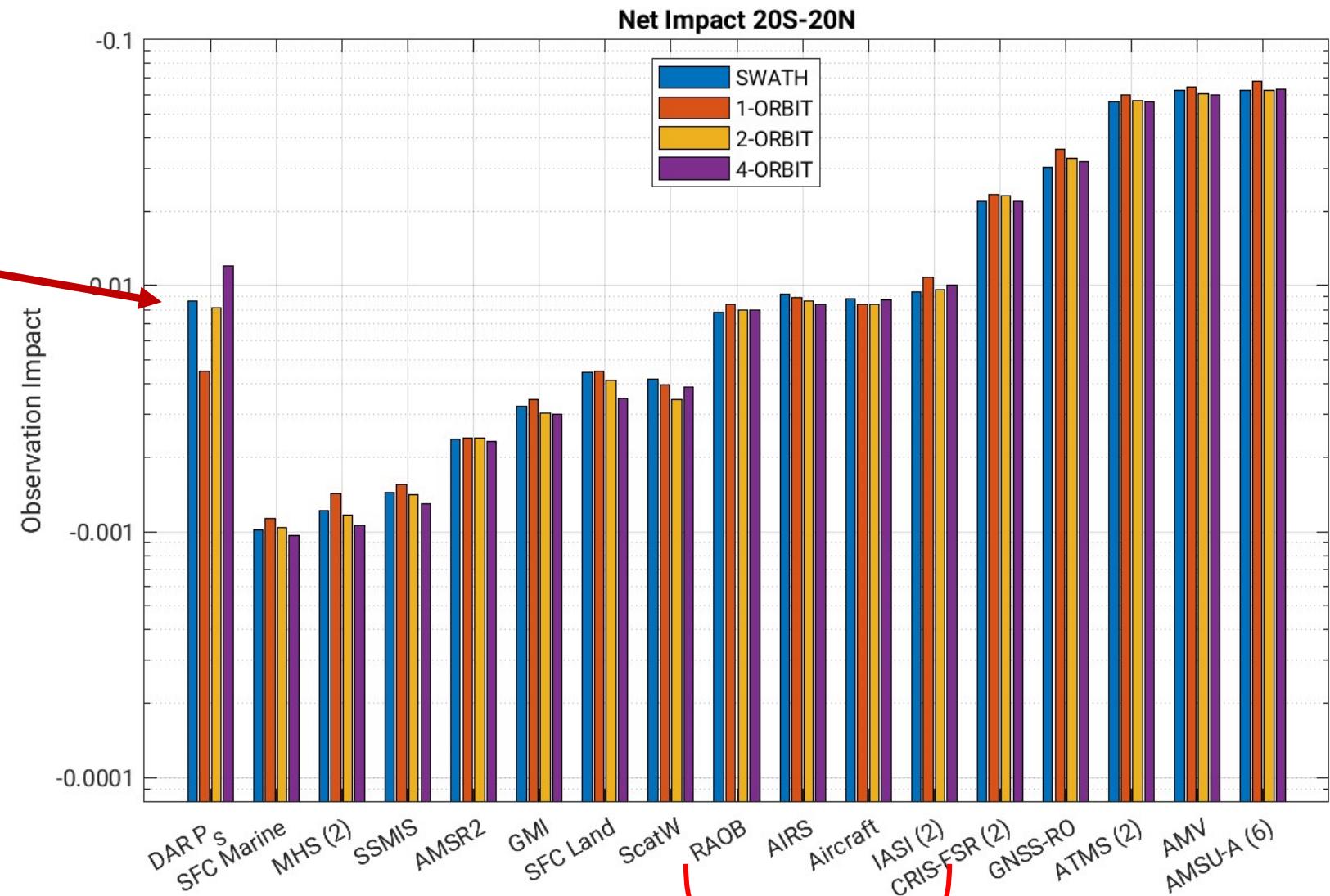
YELLOW = Degradation

Delayed model
feedback?

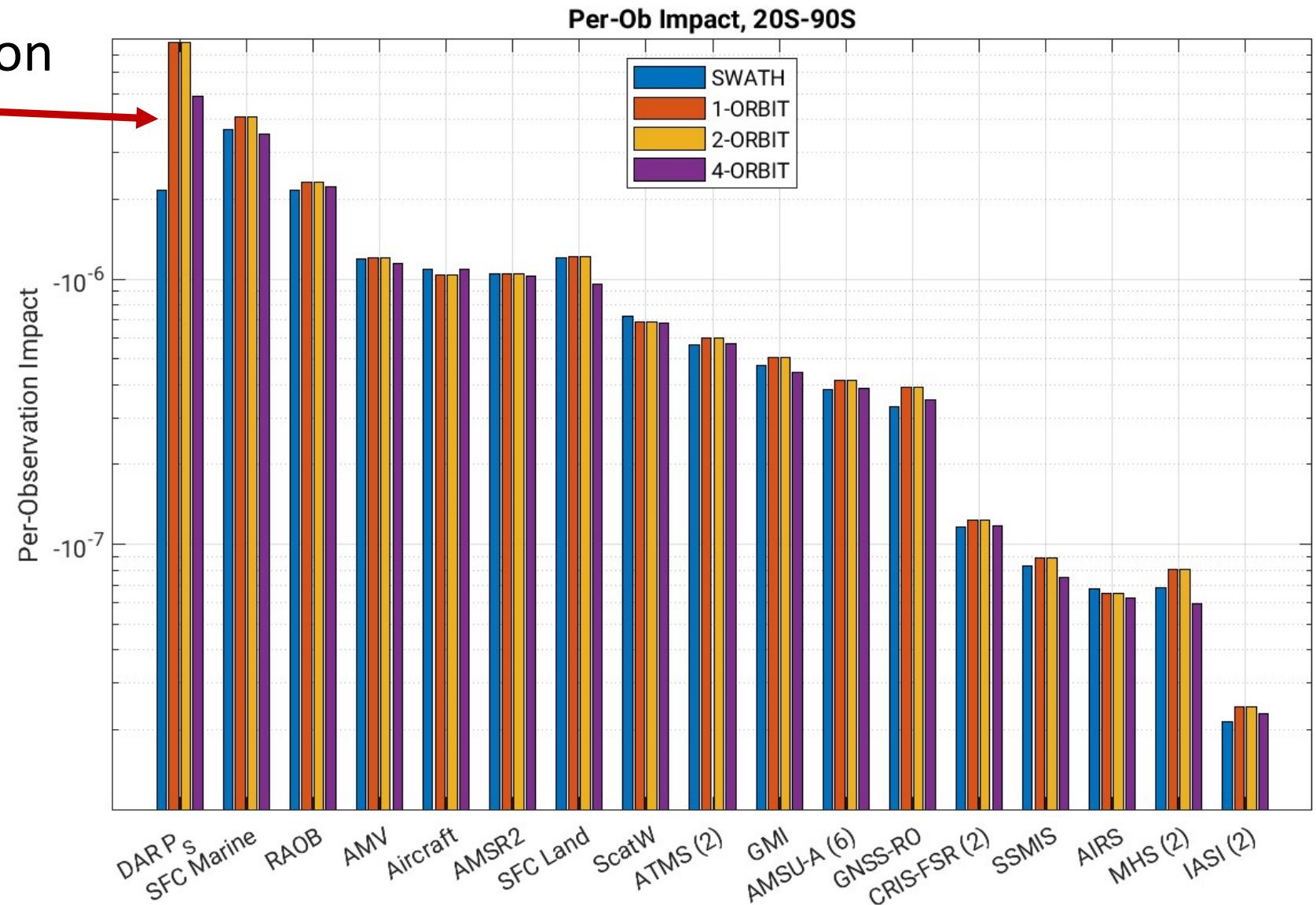




Total impacts on par with rawinsondes, aircraft, AIRS, and IASI

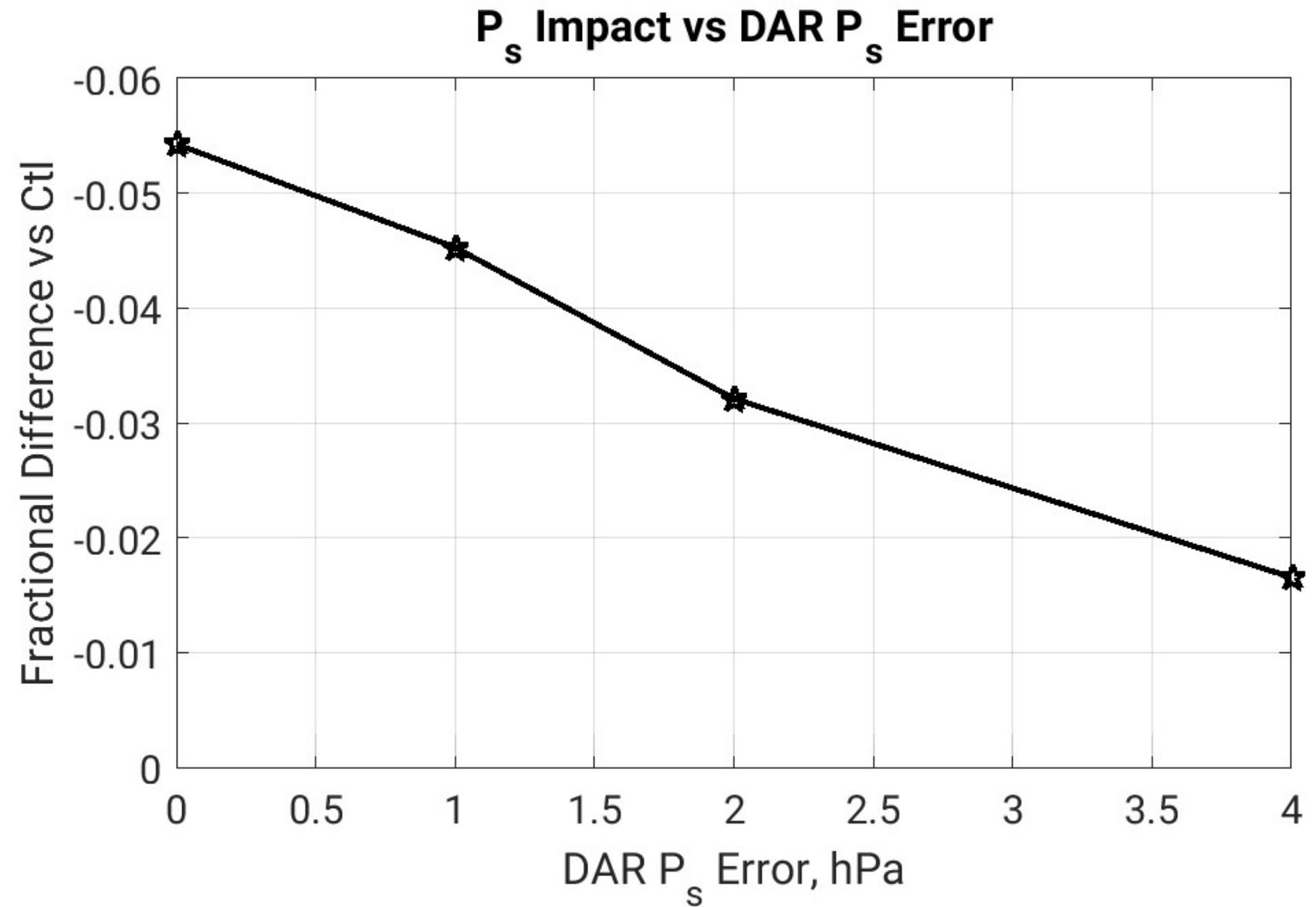


Large per-observation
impacts



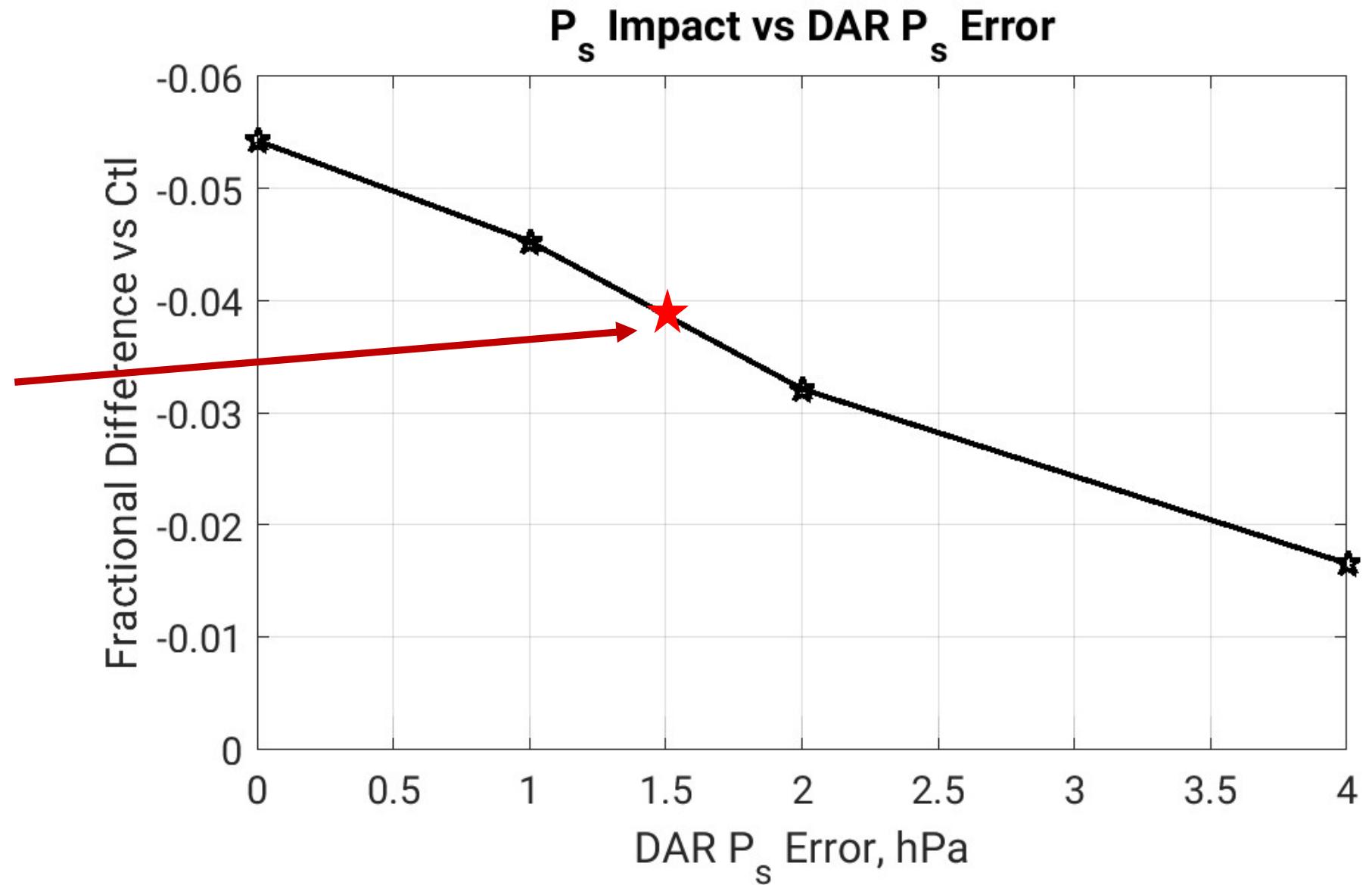


Added random
DAR P_s errors



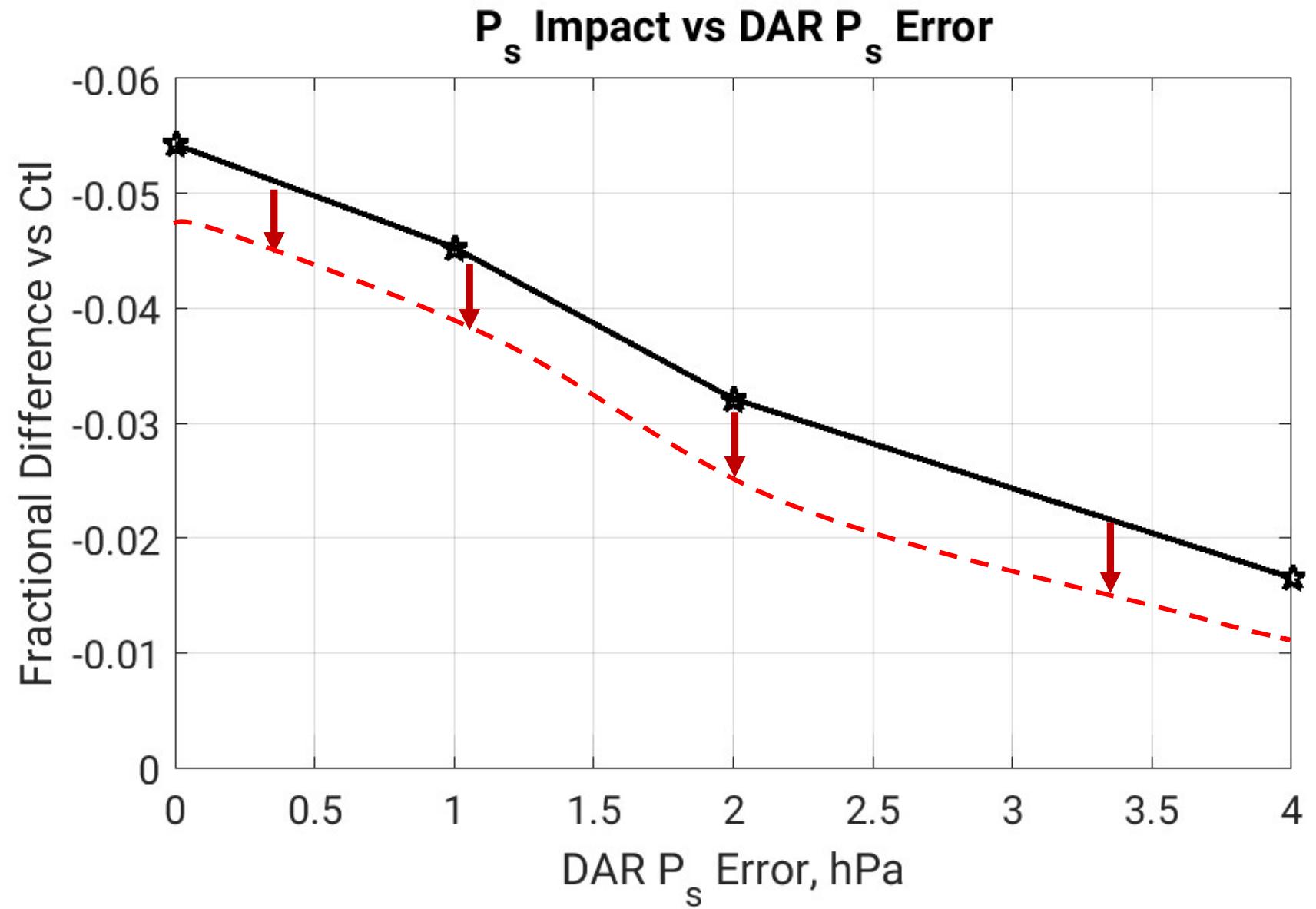


OSSE tests,
approximate





Correlated obs
errors - expected
effects

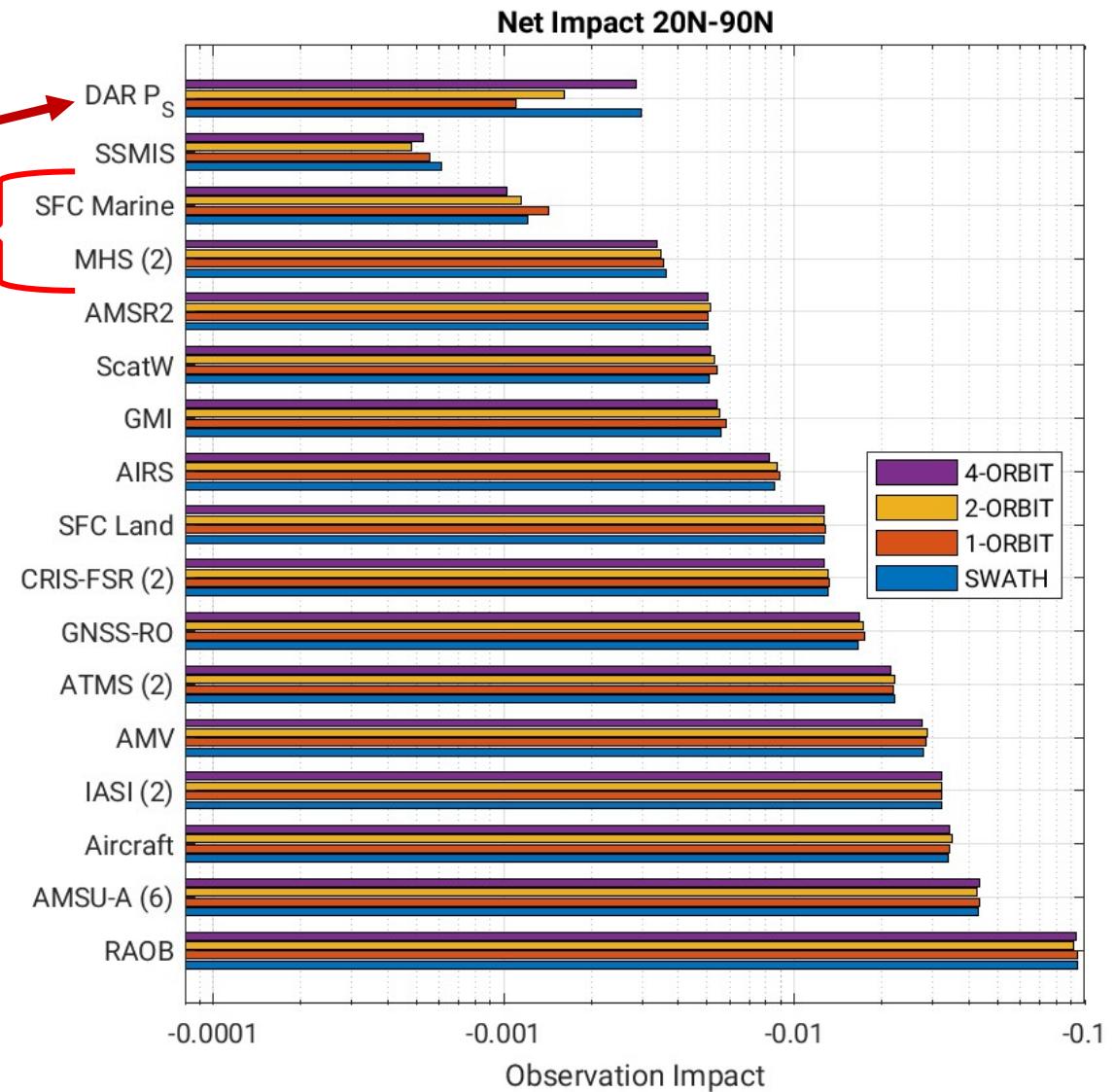




- Nadir 4-satellite constellation outperforms single scanning orbit
- Observation impacts greatest in the extratropics
- Beneficial impacts seen with a broad range of observation errors

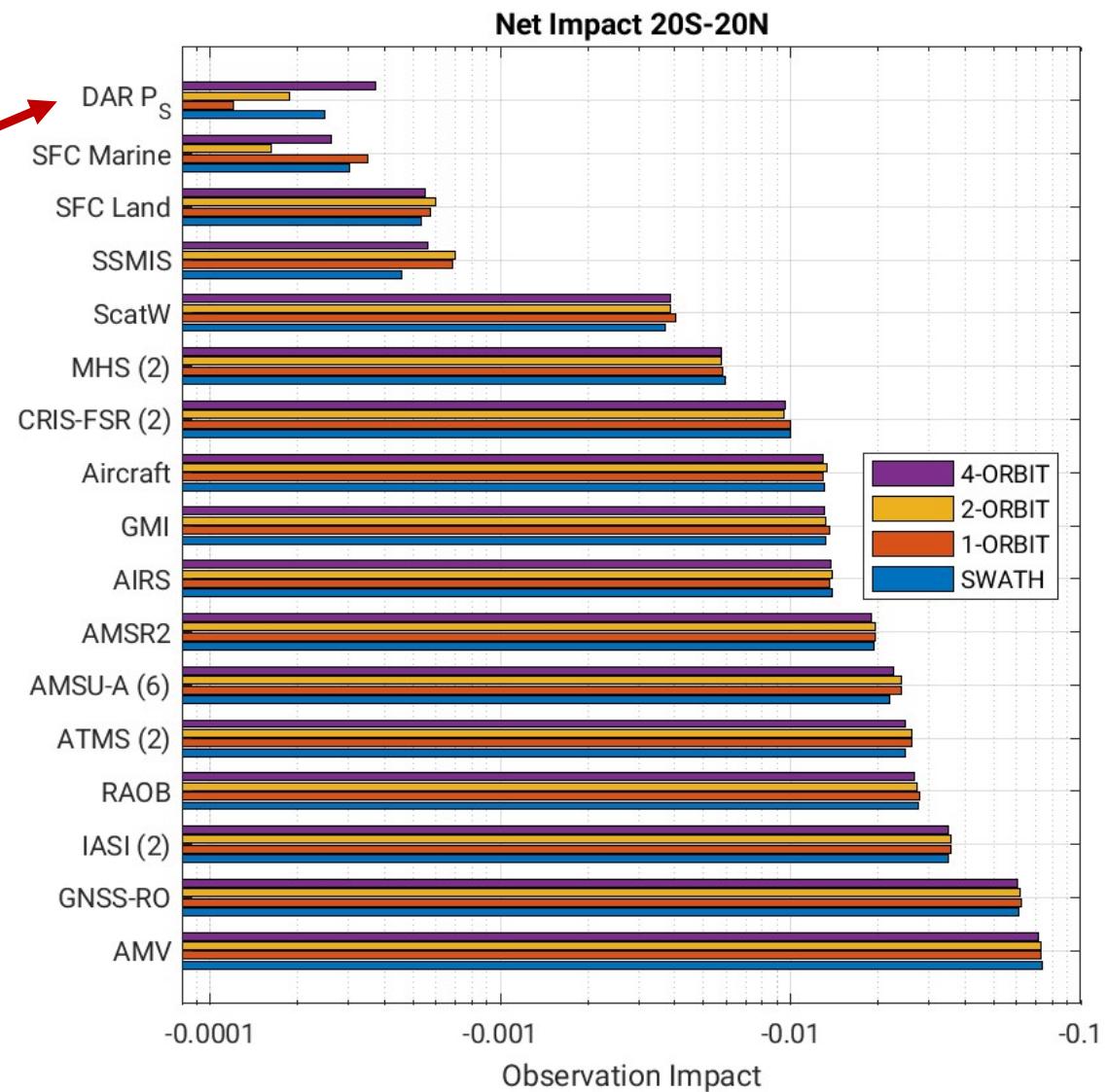
Extra Slides

Total impacts on par
with ships/buoys and
MHS





Total impacts on par
with ships/buoys



Reasonable impact
for the range of
expected
observation error
(1-2 hPa)

